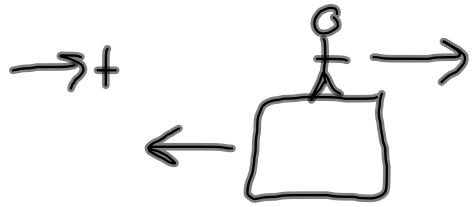
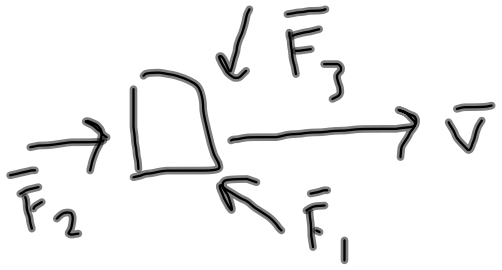
A 55 kg swimmer is standing on a stationary 215 kg floating raft. The swimmer then runs off the raft horizontally with a velocity of 5.1 m/s relative to the shore. Find the recoil velocity that the raft would have if there were no friction and resistance due to water.



$$(m_p + m_r)\cancel{\vec{v}_i} = m_p\vec{v}_{fp} + m_r\vec{v}_{fr}$$

$$m_r\vec{v}_{fr} = -m_p\vec{v}_{fp}$$

$$v_{fr} = -1.3\ m/s$$



Some momentum: $\bar{p} = m\bar{v}$

When forces act: $\bar{\Delta}p = \Sigma\bar{F}\,\Delta t$

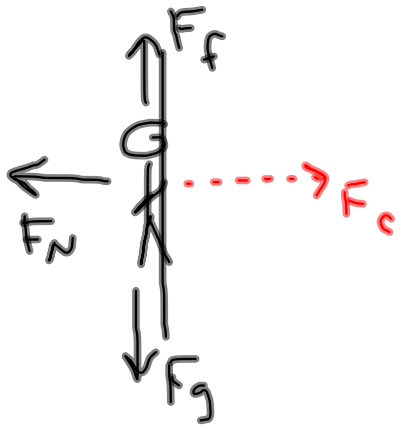
$$\Sigma\bar{F} = \frac{\Delta\bar{p}}{\Delta t} = \frac{\Delta(m\bar{v})}{\Delta t} = m\frac{\Delta\bar{v}}{\Delta t} = m\bar{a}$$

At amusement parks, there is a popular ride where the floor of a rotating cylindrical room falls away, leaving the backs of the riders "plastered" against the wall. Suppose the radius of the room is 3.25 m and the speed of the wall is 13.0 m/s when the floor falls away.

a) What is the source of the centripetal force acting on the riders?

b) How much centripetal force acts on a 55.0 kg rider?

c) What is the minimum coefficient of static friction that must exist between the rider's back and the wall, if the rider is to remain in place when the floor drops away?



a) spinning cylinder

b) $F_c = m\frac{v^2}{r}$

$= 2866\ N$

c) $\mu_s = \frac{F_{fs}}{F_N}$

$= .188$

$\Sigma F_y = 0$

$F_{fs} = F_g$

$\Sigma F_x = ma_c$

$F_N = m\frac{v^2}{r}$

A 200 g block connected to a light spring for which the force constant is 5.00 N/m is free to oscillate on a horizontal, frictionless surface. The block is displaced 5.0 cm from the equilibrium and released from rest.
a) Find the period of its motion.
b) Determine the maximum speed of the block.
c) What is the maximum acceleration of the block?

a) $T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{m}{k}}$

$= 1.26\ s$

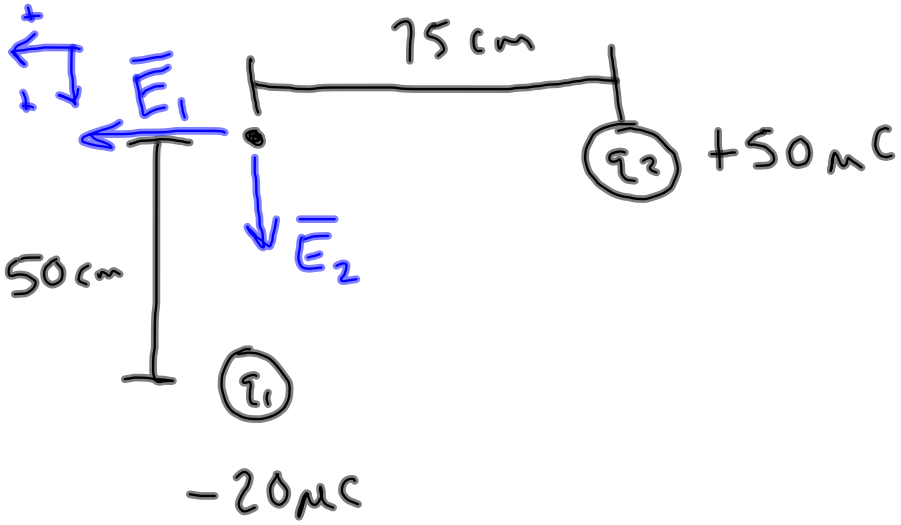
b) $v_{max} = \omega A = \sqrt{\frac{k}{m}}\, A$

$= 0.25\ m/s$

c) $a_{max} = \omega^2 A = \frac{kA}{m}$

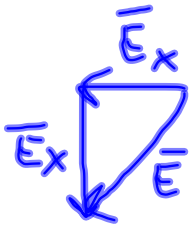
$= 1.25\ m/s^2$

Find net $\bar{E}$ - field at point:



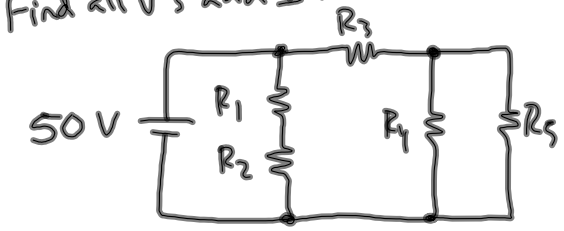
$$\Sigma \bar{E}_x = \bar{E}_{1x} + \cancel{\bar{E}_{2x}}^{\,0} = \frac{k|q_1|}{r_1^2} = 799111 \text{ N/C}$$

$$\Sigma \bar{E}_y = \cancel{\bar{E}_{1y}}^{\,0} + \bar{E}_{2y} = \frac{k|q_2|}{r_2^2} = 719200 \text{ N/C}$$

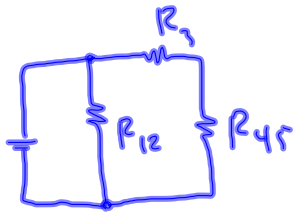


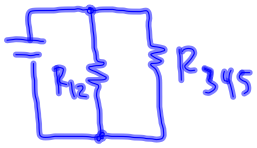
$$\bar{E} = 1.07 \text{E}6 \text{ N/C} \text{ @ } 41.9^\circ \text{ S of W}$$

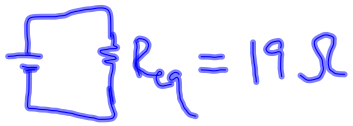
Find all V's and I's:



$R_1 = 10\,\Omega$
$R_2 = 30\,\Omega$
$R_3 = 25\,\Omega$
$R_4 = 45\,\Omega$
$R_5 = 15\,\Omega$







$I_{total} = \frac{50V}{19\,\Omega} = 2.63\,A$

$I_{12} = \frac{50V}{R_{12}} = 1.25\,A \quad I_{345} = 1.38\,A$

$V_1 = I_{12} R_1 = 12.5\,V$

$V_2 = I_{12} R_2 = 37.5\,V$

$V_3 = I_{345} R_3 = 34.5\,V$

$I_4 = \frac{15.5V}{R_4} = .35\,A$

$I_5 = \frac{15.5V}{R_5} = 1.03\,A$